nical Committee, and filled many other public appointments. He received the honour of knighthood in 1918.

It is with great regret that we learn of the death of PROF. GABRIEL LIPPMANN, Foreign Member of the Royal Society, on July 14 on board the liner *La France* while on his way from Canada, where he had formed part of the French Mission under Marshal Fayolle. Prof. Lippmann was born in 1845 and educated in Paris. His work there was concerned mainly with the relation between electrical and capillary phenomena, the outcome of which was his capillary electrometer and other instruments. His process of colour photography, announced in 1891, is widely known. In 1908 he was awarded the Nobel prize for physics, and in 1912 became president of the Paris Academy of Sciences.

WE announce with much regret the death, on June 1, at the age of seventy-nine years, of MR. CHARLES PICKERING BOWDITCH, associate of the Peabody Museum of American Archæology and Ethnology, Cambridge, Mass. Mr. Bowditch was well known for his work on Mexican and Maya codices and inscriptions.

WE regret to announce the death of PROF. J. A. MENZIES, professor of physiology at Durham University School of Medicine, Newcastle-upon-Tyne.

Notes.

THE Civil List pensions granted during the year ended March 31, 1921, amounted to 1200*l.*, and include the following:—Mrs. Frederick Enock, in recognition of her husband's services to natural science and entomology (September 7, 1920), 100*l.*; Mr. Edward Greenly, in recognition of his services in the geological survey of Anglesey (September 7, 1920), 80*l.*; Mrs. J. A. McClelland, in recognition of her husband's distinguished services as an investigator in physical science (September 7, 1920), 100*l.*; Mrs. and Miss Sharman, in recognition of Mr. George Sharman's valuable services in palæontological science (September 7, 1920), 80*l.*; Mr. John Nugent Fitch, in recognition of his long services to the cause of botany, horticulture, and natural history (September 15, 1920), 75*l.*; Mr. W. R. Hodgkinson, in recognition of his valuable scientific work in the public service (March 24, 1921), 100*l.*; and Mr. Herbert Tomlinson, in recognition of his services as a teacher, and of his valuable and distinguished contributions to physical science (March 24, 1921), 100*l.*

THE popular fallacy that explosions can precipitate rainfall found expression in the question asked by Major Morrison-Bell in the House of Commons on July 13 as to whether the Government would be prepared to initiate experiments which might possibly have the result of precipitating a downpour of rain. The answer given was to the effect that from past experiments meteorologists were of opinion that explosions would not induce a fall of rain, and rightly so; for experiments were conducted on a vast scale, not, it is true, with that particular end in view, on the Western Front during the Great War. The collation of statistics of rainfall with the gunfire failed to show any certain connection. The only way in which the water-vapour in the atmosphere can be condensed into rainclouds is by cooling. Unless an explosion can produce a cold current, or cause to any appreciable extent such a disturbance in the atmosphere as will bring about the mixture of a stratum bearing a cold current with that carrying a warmer current, it cannot produce rain. The compression in the air produced by a bursting shell is propagated as a sound-wave. The amplitude of the motion, therefore, diminishes as the square of the distance from the origin, so that at the distance of a quarter of a mile it would probably be no greater than 1/10,000th of an inch. In 1917 M. Angot, Director of the French Meteorological Office, showed that in the extreme case of two equal masses of saturated air, one at 0° C. and the other at 20° C., it would be necessary, in order to produce rain of even so small an amount as 1 mm. (0·04 in.), for the two masses rapidly and thoroughly to mix throughout an atmospheric layer of 6850 metres (about 4 miles) in thickness. Nor are dust particles and ions, which form the nuclei of raindrops, sufficient of themselves to cause precipitation unless there be a concomitant reduction of temperature.

By a resolution of the Swedish Riksdag passed on May 18 last, it has been decided to establish an institute for the investigation of the problems of racial biology. To Sweden, therefore, falls the honour of being the first country to establish a State-supported institute of this kind. The history of the movement which led up to this decision is related in a pamphlet, written in English, entitled "The Swedish State Institute for Race Biological Investigation," which has just been published by Dr. Hjalmar Anderson. The success of the movement has been due largely to the indefatigable exertions of one man, Dr. Herman Lundborg, who was the first to direct attention in Sweden to the national importance of the study of eugenics in a lecture which he delivered to the Upsala Physicians' Society in 1904. After much strenuous advocacy on the part of Dr. Lundborg and other prominent men of science, the question was brought to the notice of the Riksdag, and a report was called for. As a result of the opinions then expressed, the Government took up the matter, and Dr. B. Bergvist, the Minister of Education, drew up a recommendation, which received the Royal sanction, in which it was proposed to found an institute with an annual appropriation of 80,000 crowns. In the meantime Dr. Lundborg, with a self-sacrifice worthy of all praise, had rejected an alternative proposal to establish a chair for him in Upsala University, on the ground that a subsidy granted to an individual gave no assurance for the continued study of the subject in the future. The Riksdag, therefore, although unable to adopt the full recommendation as to the appropriation in view of the present financial situation, decided, as already stated, to establish a State institute, of which Dr. Lundborg will be the director.

In a letter referring to the leading article on "Internationalism" in Nature for July 7, p. 577, a correspondent writes to urge the necessity for a deeper and wider investigation of this complex question. In this connection attention may be directed to a little book recently published by Prof. H. J. Fleure, entitled "The Treaty Settlement of Europe" (Oxford University Press, 2*s.* 6*d.*), in which the author examines the provisions of the settlement from the ethnographic and geographical aspects. In his introductory chapter, after an admirable survey of the historical development of the conditions of life in Europe, Prof. Fleure points out that the treaties, using a framework which is largely linguistic, have attempted to apply to Europe the idea of the sovereign nation-State as it has arisen in the West; whereas, he holds, the coincidence of nation and State has been by no means close east of the Rhine. His chief and most weighty criticism of the treaties is that they tend to perpetuate conditions, and in particular the linear frontier, which have too often led to hostilities and disputes. He maintains that frontiers are really broad zones, and, further, that our politicians have failed to realise fully and to work out the implications of the fact that "in Europe we can only have unity in diversity." Prof. Fleure is perhaps inclined to attach too little weight to racial and nationalist feelings in the peoples of eastern Europe. The racial spirit of the Serb and the nationalism of the Greek are intense and deep-rooted, while in the more stolid Bulgar both sentiments are strong, if less demonstrative. Further east, in the Caucasus, which is beyond Prof. Fleure's province, in the case of the three republics which resulted from the Treaty of Brest-Litovsk, two, namely, Georgia and Erivan (Armenia), were the expression of a popular desire for a national existence which lent support to the political ambitions of their leaders.

In a letter to the *Times* of July 12 Mr. Robert Donald suggests that a corporation organised on commercial lines should be formed to conduct a general inter-Empire scheme for radio communication, the shareholders being the Governments of the States of the Empire, each represented in proportion to the capital it subscribes. The corporation should be directed by a small executive committee consisting of business men and engineers. The chain of radio stations could be built under contract, the corporation retaining ownership. The working of the system, however, should be leased to a company on attractive terms. In addition to directors appointed by the Governments, the British Radio Corporation should have on its board representatives of the Admiralty, War Office, Air Ministry, and Post Office. The advantages of this scheme are State ownership of an indispensable public service and private enterprise without monopolistic control. A company can also enter into international trade much more readily than can a union of States. The capital required for a few high-power stations with a working range of 6000 miles and low-power stations with a continuous working range of 2000 miles would not be great. The Compagnie Radio France has been constituted on somewhat similar lines. As the scheme is commercially feasible we hope that the Government will seriously consider it.

An interesting ceremony took place a few days ago at Lacock Abbey, near Bath, when, on behalf of Miss M. Talbot, a granddaughter of the late W. H. Fox Talbot and the present owner of Lacock Abbey, a large and historical collection of photographic apparatus was formally handed to Dr. G. H. Rodman, president of the Royal Photographic Society, for preservation in the society's museum at 35 Russell Square, W.C. It was Miss Talbot's desire that the collection should be placed in the care of the Royal Photographic Society, where it will be fittingly conserved with the important Hurter and Driffield collection and other photographic apparatus of national interest. The debt which modern photography owes to Fox Talbot, the brilliant scientific investigator, is not acknowledged so universally as it deserves, and although the credit for the discovery of photography may justly be attributed to the French pioneers, Niepce and Daguerre, Fox Talbot's discovery a short time afterwards revolutionised their process and made photography as it is practised to-day possible. The French process was completely different, and practically died out when wet plates were introduced. Fox Talbot was the first to produce positives from negatives, and as the inventor of the "Calotype" process he earned a title to undying fame. The collection of historical photographic apparatus which has now been entrusted to the care of the Royal Photographic Society includes a camera lucida, a sketching camera, and other scientific instruments which Fox Talbot used in his experiments, and will be specially shown during the approaching annual exhibition of the society, which will be opened to the public on September 19 next.

Some urgent appeals on behalf of Russian men of science have been received recently in Finland, and the University of Helsingfors has appointed a committee, which is endeavouring to give much-needed assistance. The frontier between Finland and Russia having been partially reopened, some Finns have been able to visit Petrograd and verify the accounts received. Already several wagon-loads of foodstuffs have been dispatched for distribution in Petrograd among men of science and their families, but it is feared that the present grave food shortage in Russian towns will become more acute in the immediate future. Supplies will therefore be required for some months, and the committee fears that the resources of Finland may not be equal to the task. In consequence, an appeal for help in this work is made to men of science throughout the world, and the committee has offered to act as an intermediary in conveying supplies to their destination. Gifts of food, clothing, and books are urgently needed, and the committee at Helsingfors guarantees that all packages entrusted to its care, which should be addressed to Prof. Mikkola, University of Helsingfors, will be delivered to the men for whom they are intended.

A dispatch from Col. Howard-Bury, leader of the Mount Everest Expedition, published in the *Times*, describes the course of the party from Kampa Dzong to Tingri Dzong, where they arrived on June 23. The illness of Mr. H. Raeburn, following on the death of Dr. A. M. Kellas, is a blow to the expedition. Mr. Raeburn was sent back to Lachen, in Sikkim, where his speedy recovery is anticipated. The march westward from Kampa Dzong does not appear to have been difficult except at times for transport troubles. The inhabitants were generally helpful. Col. Bury describes the ascent of the easy Tinki Pass leading to the wide valley of the Yaru, a tributary of the Arun. After fording the Yaru some difficulty was experienced in crossing an area of quicksands during a violent sandstorm, but no accident occurred. At Tingri Dzong the expedition was within 50 miles of Mount Everest and on the verge of the real work of exploration.

At the annual autumn meeting of the Institute of Metals to be held in Birmingham on September 21–23, a number of papers dealing with the constitution and properties of metals and their alloys will be presented. The morning sessions will be devoted to the reading and discussion of papers, and the afternoon sessions will be spent in visits to works and factories of interest in the neighbourhood. The coming meeting will be the first visit paid by the institute to its old home, and the present membership of more than 1300 is significant of the great progress made by the institute since its foundation thirteen years ago, when its membership was 200. A ballot for the election of members desirous of attending the Birmingham meeting is being arranged, and full particulars can be obtained from the Secretary, 36 Victoria Street, London, S.W.1.

We have received from the National Council of Public Morals (Rhondda House, 60 Gower Street, W.C.1) a pamphlet entitled "To Save the British Race," in which an outline of the activities of the council is given. The Birth-Rate Commission, a Special Committee on Venereal Diseases, an Adolescent Inquiry, and an Education Committee in relation to the kinematograph are some of the inquiries undertaken by the council, and valuable reports have already been published respecting some of these.

An advisory body, the Scientific Research Committee, has recently been instituted by the Sudan Government for the collection and distribution of scientific information of local interest, which will be published in *Sudan Notes and Records*. In vol. iv., No. 1, of this publication Mr. R. E. Massey has a note on the maintenance of quality of cotton grown in the Sudan, showing that there has been no deterioration over a period of years; while Mr. H. H. King discusses means for the control of the Spanish sparrow, which has become a pest in Dongola Province.

M. V. Galippe, who is well known for his papers on micro-organisms, recently claimed (*Comptes rendus*, vol. clxxi., p. 754, October 18, 1920) that "microzymas et bacilles ovoïdes," endowed with movement, could be found in powdered fossils, even after treatment of the fragment used with a Bunsen flame and sterilised liquid reagents. No movement, however, was observed in ferruginous fossils. In co-operation with Mme. G. Souffland, M. Galippe now finds (*Comptes rendus*, vol. clxxii., p. 1252, May 17, 1921) that the same results may be obtained from meteorites and from a variety of igneous rocks, including those erupted by Mont Pelé. The authors are, of course, aware of the difficulties imported into their observations by the phenomenon of Brownian movement; but they state that their ovoid organisms move, while mineral particles of finer grain remain at rest. They believe that organic tissue and water are lost during fossilisation of the organisms, but that these are recovered during the experiments. The processes adopted will seem to most workers distinctly adverse to resurrection. The authors conclude that, if all living things were swept away from the surface of the earth, life would revive, thanks to the existence of the organisms entombed in every kind of rock. It is to be feared that few workers with the microscope will trouble to repeat these experiments, remembering Dr. Hann's observations on the structure of meteorites, and Mr. R. Kirkpatrick's more recent essay on "The Nummulosphere" (Nature, vol. xci., p. 92, 1913); yet it is possible that the work of M. Galippe may lead to further study of Brownian movement among mineral particles.

The results of investigations on the froghopper-blight of sugar-cane in Trinidad are given in a memoir of the Department of Agriculture of Trinidad and Tobago by Mr. C. B. Williams. The causative insect, *Tomaspis saccharina*, its life-history, and the nature of the damage done are described, and a section is devoted to the relation of the froghopper to its natural enemies. The sugar-cane is the second important agricultural crop in the island, and during 1917–18 it suffered a loss owing to blight of 300,000*l*. The causes accounting for the heavy outbreak of blight are due to a complicated interworking of many factors. The introduction of the mongoose to the island would not appear to be an important contributory cause. The preliminary conclusions arrived at open up a wide field of fundamental research on the relation between the outbreak of blight and rainfall, the geological contour of certain districts, soil conditions, temperature, rainfall, drainage, manurial treatment, tillage methods, and the relative resistance of varieties of sugar-canes. Direct control is also discussed. The author is to be congratulated on the way in which the results of his investigations are presented. It is highly desirable that sections of the report should be extended by further experimental research.

Memoir 122 of the Canadian Geological Survey has recently reached us, and it contains a comprehensive account of the Sheep River gas- and oil-field of Alberta, situated about 50 miles south of Calgary. Prior to 1915 a great deal of development work had already been carried out by several companies, but owing to a variety of circumstances, largely influenced by the war, operations practically ceased in that year, though production has since been maintained intermittently by a few companies. The geology of the area is essentially Cretaceous, and the structures are typical of the eastern foothill ranges of the Rocky Mountains, consisting of sharp folds broken by powerful faulting consequent on long-continued earth stress. The main tectonic feature is that of the Turner Valley anticline, from which the bulk of the oil and gas has been obtained; this involves the Kootenay-Dakota, Benton, and Belly River series (in ascending order); petroliferous horizons are principally confined to the older rocks, four distinct oil-sands being recognised. Water-bearing beds were not penetrated by any of the wells put down, although two of these reached a depth of 3900 ft. The yield of gas is as much as 5,000,000 cub. ft. per day in some cases, while the best oil well (South Alberta Oil Co., No. 1) produces 30 barrels per day. The gas has an average composition of 70 per cent. of methane, the rest being ethane and nitrogen; the oil has a specific gravity of 0·736 (example from the second oil-sand), and is described as a high-grade oil; the yield of petrol, however, varies considerably. As a technical publication this memoir maintains the high standard of excellence characteristic of Canadian official literature.

METEOROLOGICAL results for 1920 at the Falmouth Observatory, a station which is financially assisted by the Meteorological Office, show that bright sunshine was registered for 1508 hours, or 245 hours fewer than the average for the past forty years. A deficiency of sunshine occurred in each month except December. Bright sunshine was registered on 308 days, a figure which is four days above the mean. The mean temperature for the year was 51·4° F., or 0·7° above the average. The absolute maximum for the year was 70·1° F. in August, which is the lowest annual maximum since observations were started fifty years ago. Rainfall was 2·08 in. above the average for the last fifty years. The relative distribution of the wind was in good agreement with the normal. A fifty years' average, 1871–1920, is given for atmospheric pressure, air temperature, rainfall, humidity, and direction of wind for each month and for the year; these add much to the valuable work which is being done at the station.

IN the July issue of the *Philosophical Magazine* Mr. E. C. Kemble, of Harvard University, reviews the evidence now available for testing the various suggestions which have been made as to the constitution of the helium atom. Bohr's hypothesis that it contains two electrons revolving in a common circular orbit is not in keeping with the known value of the ionisation potential. The models of Landé and of Franck and Reiche involve an outer and an inner electron each with its own orbit. Such an outer electron would, on the theories of Langmuir and of Sir Joseph Thomson, determine the chemical behaviour of the atom, and it would be difficult to reconcile the chemical properties of helium with those of the alkali metals. These models also give wrong values for the ionisation potential, and do not harmonise with the spectroscopic observations of Fricke and Lyman. In all the models the average angular momentum of an electron is taken to be an integral multiple of the unit, and, according to Bohr's principle, an electron on changing its orbit emits one or more units of radiation. Mr. Kemble shows that the principle cannot be applied in all cases without leading to inconsistencies, and comes to the conclusion that it must be abandoned.

IN *Science* for May 20 Dr. S. J. Barnett, of the Terrestrial Magnetism Department of the Carnegie Institution, Washington, reviews recent progress in the theory of magnetism and its simplest applications. He shows how the Weber-Langevin theory, according to which the magnetic element contains a permanent whirl of electricity with a definite magnetic moment, is incapable of explaining the known facts of dia-, para-, and ferro-magnetism, and that the magnetic element, or magneton, must be taken as having an angular velocity of its own about some axis which may or may not be an axis of figure. In these circumstances the magneton will behave as a gyrostat, and a rotation impressed on the body of which the magneton forms part will tend to make the magneton set its axis more in the direction of that of rotation of the body, and thus impart to it a magnetisation along the axis of rotation. The gyrostatic magneton in the hands of Ganz and of Honda and Okuba has yielded results which follow very closely the experimental facts, the theory of Ganz covering a wide range of cases, and in particular reproducing accurately the behaviour of dense paramagnetic bodies at low temperatures.

SIR WILLIAM ABNEY'S career as a scientific photographer forms the subject of a memorial lecture delivered by Mr. Chapman Jones before the Royal Photographic Society, and published in the *Photographic Journal* for July. From his youth Sir William Abney had more than a liking for scientific subjects, but photography was his first choice. At that time the spectroscope was beginning to take its proper place as an instrument of investigation, and he was one of the first to enter this new field and to apply the spectroscope to the elucidation of photographic problems. He took advantage of the fact that the exposure effect in a chromated gelatine film, if merely started by light, will continue to grow, and showed how the bugbear of the carbon printers could be turned to useful account. In 1871, if not earlier, Abney devoted his attention to the preparation of photographic emulsions and sensitive films, and later on obtained results from which the modern P.O.P. originated. During about twenty-four years he investigated the nature of the developable image and the course of development. By 1880 he had worked out various methods for printing by development. He made a series of experiments on developing agents, and introduced the use of hydroquinone and the ferrous-citro-oxalate developer, which need no restrainer. One of Abney's most important discoveries he called "the failure of a photographic law." He proved that the time of exposure did not vary exactly inversely to the intensity of light. It was not until 1893, after the subject had been considered for twenty-two years, that he gave details of his investigation of it. He made many successful experiments on photography in natural colours, but his greatest self-contained achievement was his photography of the infra-red. The normal spectrum as photographed on his plates was more than five times the length of the visible spectrum, for they were sensitive to the ultra-violet right away through the visible spectrum to a wave-length of 2200$\mu\mu$. Abney was accustomed to quantitative work from the first, and perhaps the most important service he rendered was the introduction of methods of measurement into scientific photography.

THE *Comptes rendus* of the Paris Academy of Sciences for June 20 contains a note by M. Baille-Barrelle on the production of coke from Sarre coal. By the usual method of coking, this coal is well known to give a poor coke, but M. Baille-Barrelle shows that, by a special mode of heating, Sarre coal can be made to yield a coke comparable with the finest cokes from Ruhr coal. The experiments were made on a semi-industrial scale (charge of 500 kg.), and preliminary work on the extension to a full commercial scale has been commenced. The coal is first maintained at a temperature of 320° C. for some time; then the temperature is slowly raised uniformly to a final temperature of 750° C., or about 200° C. below the usual coking temperature. Figures for the resistance to crushing and shaking are given. It is also claimed that the by-products obtained are superior to those given by the ordinary coke oven, and an investigation into their nature is in progress. The yield of ammonia was unexpectedly high, about double that obtained when the coal is coked in the ordinary way; owing to the lower temperature a reduced quantity of ammonia was anticipated. It is probable that the actual quantity of ammonia produced was less, and that the increased yield was due to the lessened amount decomposed into nitrogen and hydrogen. If the process is successful on the large scale, the Lorraine iron industry will be freed from the necessity of using Ruhr coke.

THE National Physical Laboratory has issued a pamphlet dealing with "Tests on Volumetric Glassware Used in Dairy Chemistry," single copies of which may be obtained free of charge on application to the Director, Metrology (Glass Testing) Department, National Physical Laboratory, Teddington. The pamphlet contains specifications as to size and construction of butyrometers, test-bottles, and pipettes which can be accepted for test by the Laboratory.

Our Astronomical Column.

AURORÆ AT A HEIGHT OF 500 KM.—The careful auroral observations made in Norway and Sweden have established the remarkable fact that some of the streamers extend to the height of 500 km. above the earth's surface. This presumably implies that there is a certain amount of atmosphere at that height, which is a conclusion of cosmical importance.

Geofysiske Publikationer, vol. ii., No. 2, contains an investigation by Dr. Carl Størmer of the height of streamers during the brilliant aurora of March 22–23, 1920. There were seven photographic stations at work in Norway on this occasion, and telephonic communication enabled simultaneous exposures to be made, the cameras being directed to the same stars. The investigation is based on simultaneous photographs taken at Christiania and Kongsberg, which are 65·7 km. apart. The streamers photographed had well-defined edges, and crossed the constellation Cassiopeia, the brighter stars being visible on the plates. The heights of seven points in the streamers are determined as 597, 550, 607, 562, 528, 485, and 519 km. respectively. Two pairs of plates are reproduced, on which the streamers and the stars are clearly visible. The author notes that it is only the extremities of the long rays that attain these great heights. The bases may be as low as 85 to 90 km.

THE MINOR PLANET EROS.—This planet will make one of its near approaches to the earth early in 1931, when there will doubtless be another solar parallax campaign. A parallax still more accurate, however, than that obtained by direct measures will probably be determined by the very large perturbations produced by the earth on the planet's motion. For this purpose it is desirable to obtain accurate observations at every opposition. The planet will next be in opposition in mid-September in N. decl. 14°, magnitude about 10½. Mr. F. E. Seagrave has computed an ephemeris for Greenwich midnight, a portion of which is given below. Corrections, due to G. Stracke, of −22s. and −2′ 7″ have been applied to the right ascension and declination:—

		R.A.	N. Decl.	Log r	Log Δ
		h. m. s.	° ′		
July	23	23 41 24	6 58·1	0·23754	9·98409
	27	23 41 23	7 50·6	0·23600	9·96672
	31	23 40 42	8 41·8	0·23438	9·94938
Aug.	4	23 39 17	9 31·1	0·23266	9·93211
	8	23 37 6	10 18·1	0·23088	9·91512
	12	23 34 8	11 2·1	0·22900	9·89861
	16	23 30 22	11 43·0	0·22700	9·88265
	20	23 25 49	12 19·8	0·22494	9·86759

JUPITER'S FOUR GREAT SATELLITES.—The Annals of Leyden Observatory (vol. xii., parts 1 and 2) consist of researches on these satellites by Prof. W. de Sitter and Dr. A. J. Leckie respectively. These parts were published in 1918 and 1919; they are therefore quite independent of Prof. Sampson's theory, which only appeared in print in 1921. One point of Prof. de Sitter's method is the use of a new intermediary orbit; instead of using the Keplerian ellipse, he substitutes for the eccentricity the great periodic inequalities. This is analogous to the use by Drs. Hill and Brown of the variation oval as intermediary orbit in the lunar theory instead of the Keplerian ellipse.

Prof. de Sitter finds for the masses of the satellites in terms of that of Jupiter 3796, 2541, 8201, and 4523 (units of the 8th decimal). In terms of the moon's mass these are 0·985, 0·659, 2·128, and 1·173. Using the diameters of the satellites found by the interferometer (mean of Hamy's and Michelson's results), viz. 1·00″, 0·905″, 1·325″, and 1·31″ at distance 5 units, the densities become 0·853, 0·788, 0·811, and 0·462 in terms of that of the moon.

Prof. de Sitter's final values of the mean daily motions of I., II., and III. referred to First Point of Aries are 203·48899280°, 101·37476180°, and 50·31764630°. These have been adjusted to fit the relation $n_1-3n_2+2n_3=0$.